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UNITED STATES NAVY

# MEDICAL NEWS LETTER

## Season's Greetings

*At this Christmastide, I wish to express to all personnel of the U. S. Navy's Medical Department my profound gratitude and deep appreciation for your many notable achievements in this eventful year of 1962.*

*Your reactions to international stresses have been translated into highly effective teamwork which has an important bearing on medical readiness in direct support of the operative forces of our nation. You have set a pattern of wisdom, loyalty, dedication, leadership and military-medical accomplishments which is most heart-warming and a pleasure to behold.*

*Our shared mission of medicine, dentistry, paramedical allied sciences, nursing, medical research in the relief of human suffering and the prevention of diseases and injuries is now and always will be an expression of the Christmas spirit. Our greatest reward is the soul-satisfaction derived from doing our very best.*

*I wish all of you, wherever you may be, a very Merry Christmas and Happy New Year.*

Edward C. Kenney

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*Rear Admiral, MC, USN*
*Surgeon General*

United States Navy

MEDICAL NEWS LETTER

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## Nonmyelomatous Amyloid Disease of the Kidney

John H. Martin MD, Assistant to the Staff, Section of Medicine; Arnold L. Brown Jr, MD, Section of Experimental and Anatomic Pathology; Guy W. Daugherty MD, Section of Medicine; The Mayo Clinic. Proceedings of the Staff Meetings of The Mayo Clinic 37: 567, October 24, 1962.

Involvement of the kidney by amyloid has been the object of study of numerous investigators (1-5) since this abnormal material was first described in 1842 by Rokitansky (6). Although there is agreement on many clinical and pathologic characteristics of this disease, there remain numerous points concerning which diametrically opposite positions have been taken. Among these are the presence or absence of hypertension (5, 7), the size of the kidneys (8, 9), and the correlation of the degree of renal involvement with various clinical manifestations of renal disease (2, 3, ).

In an attempt to resolve these varying points of view, case records and necropsy material from 36 cases of nonmyelomatous amyloid disease of the kidney were studied.

### Materials and Methods

All case records of amyloidosis in the files of the Section of Experimental and Anatomic Pathology at the Mayo Clinic for the years 1946 through 1960 were studied. Also, microscopic sections of the kidneys removed at necropsy were examined after fresh staining with methyl violet, and sections of bone marrow were examined for evidence of myeloma. Records of patients with a clinical or pathologic diagnosis of multiple myeloma were excluded from consideration. In the 36 cases accepted for the present series, renal involvement by amyloid was revealed by definite metachromasia in sections stained with methyl violet.

### Results

The 36 patients were divided into four groups on the basis of Heller and associates' (10) clinical classification of renal amyloidosis: The 9 patients in group 1 included those with no clinical evidence of renal disease and with only minimal proteinuria (0 to 1 plus of a possible 4 plus). The 18 patients in group 2 had chronic proteinuria (grade 1 to 4) or other abnormal findings on urinalysis. The 2 patients in group 3 presented with the nephrotic syndrome as defined by the following criteria: chronic proteinuria, peripheral edema, and a significant decrease in serum albumin, that is, less than 3.5 Gm per 100 ml. Elevation of blood cholesterol was not included as a criterion. No patient with significant azotemia was included in groups 1 through 3. The 7 patients in group 4 had clinical and laboratory manifestations of renal failure. This included significant azotemia (greater than three times the upper limit of normal for blood urea) with or without abnormal values for the blood electrolytes.

The degree of amyloid involvement of the glomerulus of the kidney was graded from 1 to 4 on the following basis: Grade 1 indicated that less than one fourth was occupied by amyloid; grade 2, that from one fourth to one half was so occupied; grade 3, that from one half to three fourths was so occupied; and grade 4, that from three fourths to all of the glomerulus was replaced by amyloid. (The selection of the grade was based on an "average glomerulus," estimated after scanning an entire section.) The arteries were classified as small (less than the diameter of a glomerulus) and large. For the purpose of this report, no attempt was made to determine the degree of involvement of arteries, tubules, or interstitial substance; they were simply considered to be involved or not involved.

This information, along with the clinical and laboratory data obtained from the clinical records, was recorded and correlated using the optical incidence data storage and retrieval method devised by Campbell and Caron (11).

Table 1
Clinical Observations in Patients With Renal Amyloidosis

| | Cases, according to clinical group | | | |
|---|---|---|---|---|
| | 1 | 2 | 3 | 4 |
| Number of patients | 9 | 18 | 2 | 7 |
| Hypertension | 5 | 8 | 0 | 0 |
| Goiter | | | | |
| Present | 0 | 3 | 0 | 3 |
| Amyloid | 0 | 1 | 0 | 3 |
| Funduscopic examination | | | | |
| Normal | 0 (4)* | 4 (12) | 0 (1) | 2 (2) |
| Abnormal | 4 | 8 | 1 | 0 |
| Cause of death | | | | |
| Postoperative | 4 | 3 | 0 | 0 |
| Renal | 0 | 0 | 1 | 6 |
| Cardiac | 3 | 9 | 1 | 1 |
| Other | 2 | 6 | 0 | 0 |
| Etiology | | | | |
| Primary | 1 | 5 | 1 | 0 |
| Secondary | 8 | 13 | 1 | 7 |

*Numbers in parentheses indicate number of patients examined funduscopically.

Clinical Observations (Table 1). Hypertension was conspicuously absent in groups 3 and 4. Hypertension in groups 1 and 2 seemed to correlate with increasing age. In 3 of the 7 patients in group 4, an enlarged thyroid gland was felt clinically and noted to contain amyloid at postmortem examination. As expected, patients with clinically serious renal disease were more prone to die of renal failure. Six of the 7 patients in group 4 died in renal failure, whereas none of the patients in groups 1 and 2 did so. All of the patients in group 4 were considered to have secondary amyloidosis.

Laboratory Observations. Laboratory data were used in separating the various clinical groups. This is reflected in Table 2.

Table 2
**Laboratory Observations in Patients With Renal Amyloidosis**

| | Cases, according to clinical group | | | |
|---|---|---|---|---|
| | 1 | 2 | 3 | 4 |
| Number of patients | 9 | 18 | 2 | 7 |
| Urinary specific gravity greater than 1.010 | 7 (8)* | 14 | 1 (1) | 3 |
| Proteinuria | | | | |
| Grade 0 to 1 | 8 (8) | 2 | 0 (1) | 0 |
| Grade 2 | 0 | 14 | 0 | 5 |
| Grade 3 to 4 | 0 | 2 | 1 | 2 |
| Blood urea | | | | |
| Normal | 4 (6) | 7 (16) | 0 (1) | 0 (7) |
| Slight elevation | 2 | 9 | 1 | 3 |
| Marked elevation | 0 | 0 | 0 | 4 |

*Numbers in parentheses indicate number of patients examined for designated abnormality.

Pathologic Findings (Table 3). The degree of glomerular replacement by amyloid varied widely in each clinical group. Although specimens from three cases in group 4 had grade-4 involvement of the glomeruli, those from four of the seven cases in this group manifested only grade-1 or 2 involvement. In general, little correlation could be found between the degree of involvement and the clinical status of the patient prior to death. The most consistent finding was that of amyloidosis of small arteries, that is, arteries with diameters

Table 3
**Pathologic Findings in Kidneys From Cases of Renal Amyloidosis**

| Findings | Cases, according to clinical group | | | |
|---|---|---|---|---|
| | 1 | 2 | 3 | 4 |
| Site of amyloid deposits | | | | |
| Glomerulus | | | | |
| Grade 1 | 3 | 7 | 0 | 2 |
| Grade 2 | 2 | 7 | 1 | 2 |
| Grade 3 | 2 | 0 | 1 | 0 |
| Grade 4 | 0 | 2 | 0 | 3 |
| Lobular deposits | 2 | 1 | 0 | 1 |
| Small arteries* | 9 | 17 | 2 | 7 |
| Large arteries | 4 | 13 | 2 | 7 |
| Tubules | 2 | 4 | 2 | 4 |
| Interstitial substance | 4 | 5 | 1 | 6 |
| Combined kidney weights | | | | |
| Normal | 3 (8)† | 12 (16) | 1 | 5 (7) |
| Increased | 0 | 1 | 1 | 0 |
| Decreased | 5 | 3 | 0 | 0 |

*Arteries with diameters smaller than the diameter of a glomerulus.
†Numbers in parentheses indicate number of cases for which combined kidney weights were determined.

less than the diameter of a glomerulus. This was present in kidneys from 35 of the 36 cases studied, being absent in one from a case in group 2. Large vessel involvement was relatively common in kidneys from cases in groups

1 and 2 and present in all of those from patients classified as group 3 or 4. Amyloid was seen in the tubules in relatively few of those from patients in groups 1 and 2, but was slightly more common in those from group-4 patients and was present in those from both group-3 patients. Interstitial tissue revealed a variable degree of replacement in slightly less than half of the kidneys from patients in group 1 and in 6 of the 7 cases in group 4. No correlation could be demonstrated between the combined weights of both kidneys from a case and the clinical status prior to death. It is of particular interest that those weights were normal in five group-4 cases. Tab. 4 indicates involvement of organs other than the kidney.

Table 4
Amyloid Involvement of Other Organs in Cases of Renal Amyloidosis

| | Available for study | Amyloidosis present | |
|---|---|---|---|
| | | Number | Per cent |
| Spleen | 36 | 20 | 56 |
| Liver | 36 | 17 | 47 |
| Colon | 16 | 9 | 56 |
| Jejunum | 17 | 13 | 76 |
| Thyroid gland | 36 | 4 | 11 |

## Comment

The most striking result of this investigation was the almost random distribution of amyloid involvement of the various portions of kidney in the four clinical groups. Although there seemed to be some tendency for more universally severe involvement of kidneys from patients in group 4 (just as extensive disease sometimes was found in those from patients in each of the other groups), there was a similar lack of correlation between the severity of involvement of the various units within a given kidney.

The renal structure most often involved was the small artery. This fact is considered to provide evidence against the contention that the initial site of deposition of amyloid in the kidney is the glomerulus. It would seem, rather, that the small artery is the site of the initial involvement.

The combined weights of the two kidneys have little relation to the clinical status of the patient before death. Although the majority of the combined weights of kidneys from clinical group 1 were decreased, this could not be distinguished from the commonly seen atrophy secondary to nephrosclerosis of kidneys in older patients. It is of particular significance that in all of the cases in group 4 for which combined weights of kidneys were available the weights were within the normal range.

Patients in group 4, those with both clinical and laboratory evidence of renal failure, revealed certain characteristics which could serve to help distinguish them from patients with renal failure due to causes other than amyloidosis. All 7 had significant proteinuria, none were hypertensive, and 3 had enlarged thyroid glands. It was the clinical impression in these three cases that the consistency of the thyroid gland was similar to that found in Hashimoto's thyroiditis and in diffuse carcinoma. Enlargement of the thyroid gland associated with amyloid disease has been noted previously (12) and, with the other factors mentioned, may serve to implicate amyloidosis as the etiology of renal failure in a particular patient.

Funduscopic examinations were performed in 19 of the patients. It is considered significant that the fundi were normal in the two cases of renal failure in which this examination was made. However, in all four of the patients in group 1 who were examined funduscopically, minor abnormalities often associated with hypertensive disease were observed.

Amyloid involvement of other organs in patients with renal amyloidosis is fairly consistent and of considerable importance from a diagnostic point of view. From the data reported in this review it appears that the most likely organ to be coincidentally involved is the jejunum. The availability of a safe and simple technic for biopsy of jejunal mucosa should aid considerably in making the diagnosis of amyloidosis (13).

The data also suggest that some factor or factors in addition to amyloid must be present in the kidney to produce the nephrotic syndrome and renal failure. This follows from the widely divergent amounts of amyloid deposited in kidneys representing the four clinical groups.

## Summary

After excluding cases with multiple myeloma, records and necropsy specimens of 36 cases of renal amyloidosis, as demonstrated by metachromasia with the methyl violet stain, were studied. Comparisons were made, using the method of optical incidence, of amyloid deposits in the anatomic elements of the kidney. Their extent was related to clinical and laboratory data.

Amyloid deposits occurred in the small renal arteries in 35 of the 36 cases and in the glomeruli in 32. No correlation was found between the amount of amyloid in the glomeruli, blood vessels, tubules, and interstitial tissues, on the one hand, and renal weight, blood pressure, proteinuria, retention of urea, specific gravity of urine, serum proteins, and clinical renal symptomatology, on the other. When amyloid was found in the kidney it was also present in the small intestine in 76% of cases; in the colon in 56%; in the liver in 46%, and in the heart in 45%. A significant number of patients with renal amyloidosis (36%) had hypertension, but all patients in this series who had renal failure or the nephrotic syndrome were normotensive. Six patients with renal amyloidosis had an enlarged thyroid gland. Contracted kidneys did not occur in the patients with the nephrotic syndrome or with renal failure and were present only in those patients with proteinuria without chemically significant renal disease. Renal amyloidosis occurred in patients without proteinuria or other signs or symptoms of significant renal disease. All 7 patients with renal failure had significant proteinuria, which is unusual. Most patients with renal failure associated with amyloidosis were normotensive, had proteinuria, and had normal optic fundi; and about one half had an enlarged thyroid gland.

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# GLAUCOMA AND TONOMETRY

By CAPT James M. Woodward USAF MC, USAF Hospital Andrews, Andrews AFB, Md. Reprinted from The United States Air Force Medical Service Digest, Vol. XIII, No. 5, pp 19-21, May 1962.

## Glaucoma

The term "glaucoma" is applied to several separate and distinct conditions of the eye which, however, have one thing in common. This common characteristic is the presence of elevation of the intraocular pressure above a physiologically tolerable level so that damage occurs to the eye. The pressure elevation may be acute and explosively symptomatic as in "angle-closure" glaucoma; it may be insidious and without obvious symptoms until the ocular damage is rather great as in some "open-angle" ("simple") glaucomas; or its symptomatology may lie somewhere in between. It is true that there are cases of glaucoma which never appear to have pressure rises exceeding the upper "average normal" limit, but these are extremely uncommon and their detection and diagnosis complex.

Estimates of percentage of the populace afflicted with some form of glaucoma, primary or secondary, vary depending on the criteria used, type and location of the population examined, and similar factors. It may be said that somewhere in the range of 1% of the American people probably has a definite glaucoma which is being, or should be, treated. Another segment of the population to be considered, however, is the rather large "suspicious" group which have some signs of one of the diseases of this complex. This group has been estimated variously up to 15% of the population.

### Detection of Glaucoma

In general, detection and diagnosis of glaucoma is best left to the ophthalmologist. The tests which he uses may include indentation tonometry, visual fields, tonography, biomicroscopy, gonioscopy, ophthalmoscopy, aplanation tonography,

and any of several provocative tests. For obvious reasons, many people will never see an ophthalmologist and, thus, some glaucoma suspects will be missed. If some screening measures were done during regular physical examination, the occurrence of missed glaucoma and blindness would undoubtedly decrease.

### Screening Procedures

Screening tests for glaucoma have the same fallabilities as screening measures done for detection of other conditions—there will be false positives and false negatives. An ideal screening test should be available, easily accomplished, and readily interpretable. Of all the tests for glaucoma, indentation tonometry best fits these criteria.

## Indentation Tonometry with Schiotz Tonometer

The form of indentation tonometry most frequently done is, unfortunately, finger palpation. This test has only occasional worthwhile uses, and its employment as a screening measure is not to be recommended.

Only one form of indentation tonometry is accepted by essentially all authorities at this time. This is tonometry done with a calibrated Schiotz tonometer. This instrument measures the depth of indentation of the cornea of the eye produced by a given force acting over a constant area. The indentability of the eye is determined in part by its internal pressure, but is not identical with this pressure nor does it vary absolutely with it. It offers, however, a very satisfactory way of judging the approximate intraocular pressure. The scale reading of the tonometer, while it rests on the eye of the examinee, is translated to calculated intraocular pressure by the use of a calibration table. The most recently calculated and best accepted one is the "1955 Calibration Table for Schiotz Tonometers."

### Technic

Tonometry should be as simple and brief as possible. A long buildup to the patient may excite him and affect the readings, as may abruptly confronting him with an instrument poised hovering just above his eye. Generally, the procedure is as given below:

Lay the patient back comfortably so that the plane of the face is parallel to the floor. Take care that his neck is not hyperextended and that there is nothing constricting his neck to increase jugular pressure.

Place one or two drops of topical anesthetic in each eye. Suggested medications are 0.5% tetracaine, 0.5% proparacaine, benoxinate hydrochloride, 0.5% dyclonine hydrochloride. Cocaine is contraindicated.

Have the patient fixate on an object directly above his head with both eyes open. His own thumbnail works very nicely for this and gives an excellent

proprioceptive clue to the position of the fixation point while tonometry is being done.

Firmly hold the tonometer vertically by the wing-like handle between the thumb and index and/or middle finger, and place the footplate of the instrument centrally on the cornea until the wing handle slide slips freely on the shank of the tonometer. It is important that the instrument be held vertically. The examiner's other hand may be used to help support the patient's upper and/or lower lid against the bones of the brow and/or cheek. This is done in this manner to relieve any lid pressure or pressure by the examiner's fingers. Observe the scale reading avoiding parallax as much as possible. Best readings are those which are accompanied by a waivering of the needle synchronous with the pulse.

Remove the tonometer. Check the other eye. Refer to the 1955 Calibration Table and record the pressure in millimeters of mercury mentioning the tonometer weight used. The 5.5 Gm weight is used most frequently. The purpose of the change of weights is that, by employing them, the instrument may be used between its most accurately measuring limits on the scale—between 3 and 7 units. These limits are marked in red on many tonometers. The larger weights are attached simply by laying any one of them upon the 5.5 Gm weight. The weights added actually represent the difference between 5.5 Gm and the number printed upon each additional weight. That the "7.5" weight really weighs only 2.0 Gm, so that when added to the 5.5 Gm weight the total is 7.5 Gm. By the same token, the "10" is 4.5 Gm and the "15" is 9.5 Gm.

## Interpretation of Reading

Interpretation of the pressure reading is complex and should, by all rights, be done in the light of other studies. However, when tonometry is used as the sole screening device, arbitrary limits must be set and only results outside these limits must be considered "abnormal" for purposes of the test. This does not mean that pressures above the limits are in any way indicative of glaucoma or that pressures below the limits (if lower limits are stated) are otherwise pathologic. It may be said, however, that among those subjects who have a measured pressure above 25 mm Hg (Schiotz 1955 scale) there will be a fair percentage who have, or will get, other stigmata of glaucoma. Among those having a measured pressure of 20.6 mm Hg or less, only a very small number will develop other such stigmata.

The suggested upper "normal" limit for screening purposes is, therefore, set by many authors at any measured pressure above 20.6 mm Hg or less (Schiotz 1955 scale) than 4.0 scale units with a 5.5 Gm weight. Measurements exceeding these limits should have ophthalmologic consultations. Usually, there are no stated minimum pressure limits set. It is of value, however, to note that differences of measured pressure between the two eyes at the same examination of more than 5 mm Hg should probably also warrant ophthalmologic

consultations even if both pressures are below the 20.6+ limit. A variation of more than 5 mm Hg in an eye at different times of examination might also be viewed with some suspicion.

Tonometer Care and Handling

Cleaning and care of the tonometer are tantamount to its continued good function and avoidance of disease transmission. Devices are available which are designed to accomplish the task of tonometer sterilization. Their results, however, are not ideal and they may be cumbersome when a tonometer is used only infrequently.

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## Fatigue Fractures in Track Athletes *

Martin E. Blazina MD, Robert S. Watanabe MD, and Elvin C. Drake L.P.T., Los Angeles. California Medicine 97: 61-63, August 1962.

Unlike the usual muscle pulls and ligamentous sprains that one encounters in the physical care of track athletes, which are invariably related to a specific traumatic episode, fatigue fracture is usually not associated with a definite injury. With awareness of certain peculiarities in the clinical pattern, however, one can come to a tentative and ultimately definite diagnosis in these sometimes perplexing cases.

Typically, the athlete—most often a middle-distance runner—complains initially of insidious onset of an aching or soreness of a leg or foot not unlike that of leg or foot strain, or "shin splints." Most commonly, the pain is localized to the lateral region over the distal fibula. In some instances, it may be in the lateral portion over the proximal fibula, and occasionally over the medial aspect of the shin. If the foot is involved, the tenderness is over the affected metatarsal bone. The discomfort is made worse by running and will lessen or abate with rest or ordinary walking. The usual measures of whirlpool or manual massage, taping, or local injections of cortisone give temporary relief but on resumption of vigorous running the symptoms recur.

Upon physical examination, tenderness will be noted over the bone at the involved site. Although the tenderness may appear to extend along the periosteum or tendinous structures for some distance either proximally or distally, there is always a point of maximum intensity at the point of fracture.

Usually, the pain spontaneously subsides after 3 or 4 months if the athlete does no running, and training then can be resumed. Occasionally, the symptoms are more prolonged and an entire season may pass without a return to competition.

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At the onset of symptoms, roentgenologic examination including spot films may show no evidence of fracture. After 3 to 4 weeks a localized area of periosteal irritation may be noted, and somtimes a faint radiolucent line traversing the width of the involved bone may be visualized. After 8 to 12 weeks, near the time of abatement of symptoms, X-ray films will show formation of callus, occasionally about an obvious fracture line. In most instances, this observation will establish a diagnosis that has been elusive up to this time.

Since ordinary activity usually is not particularly painful, immobilizing the site of fracture is not often necessary, although if symptoms are severe, a walking plaster cast may be indicated.

Prevention of fatigue fracture depends upon altering the training program. Such lesions, which occur most frequently in athletes who run the middle distance events, appear to be related to the intensiveness of the training program and perhaps to the hardness of the running track. Therefore, most coaches instruct their runners not to work out vigorously every day and to do part of their training on grass or soft courses. That the nature of the running specialty is related to fatigue fracture is indicated by the relatively high incidence of such lesions among quarter-milers who must keep a strong pace from the very beginning of the race and sprint at the finish. In their training program, these runners must do sprints for speed and run distances for endurance. This combination of requirements might lead to the development of fatigue fracture.

* * * * * *

## Surprises in Operations on the Inguinal Area in Young Children

Richard M. Marks MD, Encino, Calif. California Medicine 97: 75-76, August 1962.

Perhaps the most common operative procedures in infants and young children involve the inguinal area for the repair of hernia, hydrocele, and undescended testicle. Many of the unexpected findings in such operations are peculiar to children. An awareness of the possibility of such surprises is essential to physicians who do inguinal operations in pediatric age groups.

Instances of unexpected pathologic conditions are drawn from the author's practice and from his experiences and those of other surgeons in a large children's hospital (Table 1, page 15). "Lumps" in the groin in children are classified in Table 1 for the purpose of differential diagnosis.

### Congenital "Lumps"

The first unusual situation involving congenital hernias concerns sliding hernia in the male. The first step is to make the incision longer than that routinely used for exposure. Frequently, only a small sliding element is present and the reconstruction of a 360° peritoneal circumference at the internal ring can be

accomplished without a counter incision. If the hernia is large and the anatomic features are hard to identify, a La Roque maneuver, such as is used in adults can be used quite satisfactorily. Unless good exposure is accomplished there is hazard of inadvertent removal of tissue that is not a part of the hernial sac.

Table 1 - "Lumps" in the Groin of Children
Differential Diagnosis

CONGENITAL
- Hernia
  - Indirect
    - Complete
    - Incomplete
  - Sliding
    - Male: cecum, appendix, sigmoid
    - Female: tube, ovary, uterus
  - Littré
  - Pseudo-hermaphrodite
- Hydrocele
  - Tunica vaginalis
  - Encysted, of the cord (Processus vaginalis)
  - Canal of Nuck
- Cryptorchidism
  - Unilateral
  - Bilateral
- Ectopic spleen
- Ectopic adrenal
- Diverticulum of the bladder

ACQUIRED
- Direct hernia
- Femoral hernia
- Richter's hernia
- Torsion
  - Testicle
  - Appendix testis
  - Ovary
- Incarceration

INFLAMMATORY
- Inguinal adenitis
  - Primary
  - Secondary
    - Cat scratch, etc.
- Adenitis of Cloquet's node
- Suppurative iliac adenitis

Quite common in infant girls is the finding of an ovary, a tube, or the uterus sliding into the neck of the hernial sac. Dealing with such a situation can be somewhat perplexing, for considerable bleeding is entailed in dissection of the medial aspect of the sac and the blood supply to the tube and ovary is endangered. Also, since the procedure leaves these structures hanging free within the peritoneal cavity, torsion may occur. A useful technic for reconstruction of the neck of the peritoneal sac is that of Goldstein and Potts, in which the broad ligament, tube, and ovary are inverted and the internal ring is closed, leaving the adnexal attachments and avoiding the dissection in the broad ligament.

The Littre hernia in which the sac contains Meckel's diverticulum should be dealt with in the same manner as any hernia in which tissue that ought not be removed is incarcerated in the hernial sac—by careful identification and separation before repair is carried out. If treatment of the diverticulum is necessary, a secondary incision should be made lest the inguinal area become contaminated.

In one case in which an ovary apparently was involved in the material incarcerated in a hernial sac, closer inspection brought doubt as to the identity

of the tissue and a pathologist who examined a frozen section diagnosed "testicle." The immediate course in such circumstances is to determine the character of the opposite gonad and the presence or absence of a uterus. If a second testicle is found, and there is no semblance of external male genitalia, both testicles are removed. A biopsy specimen of skin is taken for chromosomal determination of sex. Examination of buccal smears is done later. The male pseudo-hermaphrodite will fare better as an infertile female than as a male without external genitalia.

The rarest of hydroceles is that of the canal of Nuck. It is analogous to the encysted hydrocele of the processus vaginalis of the male. Lesions of this kind may not be discernible by transillumination, for often they are beneath the external oblique fascia. They may be palpable as fixed, firm fusiform, non-tender masses. Deep palpation may show them to be separate from the internal ring, which helps to distinguish them from hernia. For surgical exposure, the same kind of incision that is used for repair of hernia is used.

Cryptorchidism seems to predispose the testicle to torsion, which calls attention to the condition. At the time operation for relief of torsion is done, the opposite undescended testicle may be drawn down and anchored. The twisted testicle is never sacrificed.

The embryologic development of the spleen and the gonad from about the same area near the urogenital ridge explains why accessory spleens are found in the scrotum and along the path of the processus vaginalis. These abnormalities are easily recognized and managed by routine procedure.

Ectopically placed adrenal tissue of the inguinal area is also easily explained as the result of residual remnants of primitive cells developing in the path of the testicle and processus vaginalis.

## Acquired "Lumps"

Although rare, a direct hernia sometimes is observed in an infant or child. In the cases dealt with, these lesions caused symptoms and at operation a defect in the floor of the canal medial to the epigastric vessels was noted. Repair is by simple imbrication of the transversalis fascia.

Femoral hernia in infants, also rare, is best managed by a McVay Cooper's ligament repair and anatomic reconstruction of the abdominal wall.

The problems of incarceration include Richter's hernia and differentiation between torsion of the appendix, a testicle, or an ovary, and the ruling out of an inflammatory process. While the preoperative diagnosis is frequently correct, usually there can be no certainty without surgical exposure.

## Inflammatory "Lumps"

The inguinal canal is generally quite free of lymph nodes, but occasionally the node of Cloquet, which is the highest in the femoral area and normally lies behind Poupart's ligament, may be involved in the inguinal canal at, or just behind, the internal ring. The tumors caused by involvement of this kind are

usually deep and painful and are difficult to differentiate from incarcerated hernia or perhaps even from incarcerated interstitial hernia as seen in adults. Involvement of this node at the internal ring has been observed secondary to infantile vaginitis, to pustular diaper rash, to cat scratch disease, and to inflammation of the toes.

Although a considerable problem when it does occur, suppurative iliac adenitis is rare nowadays. In one such case, inguinal drainage was necessary, then retroperitoneal drainage of a higher abscess 4 months later, and drainage of a metastatic abscess of the omentum at the flexure 6 months after that.

5353 Balboa Boulevard, Encino, Calif.

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# MISCELLANY

## Navy Publishes New Leadership Manual

The United States Navy Leadership Manual, NavPers 15934, will soon be distributed to all ships and stations. Additional copies can be obtained from Navy Supply Centers in Norfolk, Va., and Oakland, Calif.

The Leadership Manual is a handy compilation of the leadership materials and discussion outlines which have been published separately during the last 4 years by the Bureau of Naval Personnel. However, many topics have been substantially revised for this compilation. An idea of the Manual's contents can be obtained from the chapter titles:

1. Leadership - Why and How
2. Balanced Efforts in Command Leadership
3. Five Steps to Effective Naval Leadership
4. Checks for Personal Leadership
5. How to Conduct a Leadership Discussion
6. Standard Naval Leadership Discussion Outlines
7. Use of Case and Non-Case Study Films
8. The U. S. Code of Conduct

The appendices are: (a) Indicia of Naval Leadership, (b) Publications, and (c) Films.

Chapters 1, 2, and 3 review the importance of efforts being made to improve naval leadership; point out that responsibilities, as always, remain with

the individual commanding officer and "all persons in authority"; and provide suggestions for improving even while exerting good leadership.

Chapter 4 provides checklists for personal leadership for all naval personnel and specifically for individuals at the CO/XO, DeptHead/DivOff, and CPO/PO levels.

Chapter 5 explains the purpose of and basic procedures used in a naval leadership discussion. Chapter 6 provides 38 discussion outlines. The new Manual is in looseleaf form, and additional discussion guides developed locally or supplied by the Bureau of Naval Personnel in the future can be incorporated. Chapter 7 similarly explains the purpose and use of case study films and certain other films in a leadership improvement program and suggests how to get the best "mileage" from them. Chapter 8 discusses the Code of Conduct for the U. S. Armed Forces and shows its relationship with naval leadership.

Appendix (a) consists of the Indicia of Naval Leadership which was developed by the Department of the Navy Leadership Working Group and promulgated by the Secretary of the Navy (SECNAV P5390. 1 of 1 June 1962). Appendices (b) and (c) list publications and films of special value to a leadership improvement effort.

The new Leadership Manual, according to its preface by the Chief of Naval Personnel, VADM W. R. Smedberg III, is not intended to be an "end-of-the line" document, but:

> ". . . . to provide a selective consolidation of materials produced in the past with the hope that new ideas and new techniques might be developed in the future. . . . It can be improved only if those who use it contribute ideas and suggestions for future revision. . . . This book must be used only as a guide—as a constant reminder that we are each involved every moment of every day in leadership."

From: Technical Information Office, Bureau of Naval Personnel, Dept of the Navy, Washington 25, D. C.)

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## Good Samaritan Statutes

"Good Samaritan" legislation consists of statutes designed to exempt physicians (and frequently others) from civil liability for any negligent acts or omissions arising out of rendering aid or medical care or treatment at the scene of an accident or emergency.

Statutes of this type were enacted in eight states during the 1961 legislative session. California, the first state to adopt this type of legislation, has had a "Good Samaritan" law on the books since 1959. Legislation seeking to exempt physicians from liability arising out of rendering emergency care was introduced in fifteen other states during 1961, but these failed of enactment.

In 1962, five states, Alaska, Georgia, Massachusetts, Mississippi, and Virginia, have enacted "Good Samaritan" laws. Bills dealing with this

subject were introduced in five other states, Louisiana, Maryland, Michigan, New Jersey, and New York. The New York proposal passed both houses of the Legistature but was vetoed. The Maryland bill failed of enactment, the Louisiana proposal was withdrawn and, at this writing, New Jersey and Michigan still have the proposals before them for action when the Legislatures return from their recess. (The Citation, August 15, 1962)

—Reprinted from Civil Defense Review, Council on National Security, A.M.A., Vol. 12, No. 5, October 1962.

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## World War II Observations on the Treatment of Wounds

From the Navy Department BuMed News Letter, Vol. 1, No. 8, page 19, 11 June 1943.

"Medical officers returning from the battle fronts emphasize that, in the handling of wounds aboard ship during and after battle, the quickest and simplest procedure is also the best procedure. Some have facetiously remarked that the wounded left alone without any attention except morphine seem to get along better than those who are worked on. A minimum of debridement, the dusting of sulfonamides into the wound, no closure, and immobilization seem to constitute the method of choice.

In this connection, it is of interest to note that recent and reliable information regarding German methods of primary treatment of wounds includes four "musts": (1) a minimum of debridement; (2) sulfanilamide powder dusted into the wound; (3) no closure; (4) immobilization by plaster cast with window. The Germans have forbidden the use of plaster casts without windows; also the use of ointments on account of danger of gas infection."

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## From the Note Book

About Our Christmas Cover. We offer our sincere appreciation to Mrs. Josephine L. Bottazzi and Mrs. Sara B. Hannan who designed the cover of this issue of the Medical News Letter. As Illustrators in the Graphic Services Section of the Bureau of Medicine and Surgery, these artists provide creative and medical illustrative services to all divisions of the Bureau. They have made many important contributions in the offices of the Medical Department and we are fortunate, indeed, to have them here as Navy Department career personnel.

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## Technic for Fixing Cytology Smears

Reported by CAPT D. B. Rulon MC USN, Chief of Pathology Service, USNH Oakland, Calif., at the request of RADM C. D. Riggs MC USN, U. S. Navy Inspector General, Medical.

U. S. Naval Hospital, Oakland has abandoned ether-alcohol fixation of cytology slides, substituting Diaphane resin-ethyl alcohol solution, applied, a few drops per slide, from a dropper bottle kept in examination rooms, promptly, before drying of the smear.

Advantages include elimination of ether fire hazard from pharmacy, clinic, and laboratory, as well as reduction in expense for fixing solution, and greater ease of transit of cytology specimens. Fixation and staining have been good, comparable to that obtained with ether-alcohol. The method requires (as does ether-alcohol fixation) that clinic personnel remain constantly aware of the importance of fixation before drying of the smear takes place.

Diaphane resin is purchased @ $15 per pint and is diluted with 1.5 parts 95% alcohol prior to packaging in dropper bottles and dispensed to examining rooms. Forty-two oz of this material—sufficient to process over 2500 smears—costs about $16.

The technic, published in J. A. M. A. 164: 1330-1331, 1957 by G. N. Papanicolaou, and E. L. Bridges was adopted as a result of a beneficial suggestion made by Mr. Harold Seibert GS-6, civilian technician-in-charge, tissue processing laboratory.

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Announcement on Hypoxia and Cardiac Arrest: Department of HEW, PHS, National Institutes of Health, Bethesda, Md. Cardiac arrest often occurs when oxygen levels in the blood are extremely low—a condition known as hypoxia. Current studies indicate that the heart stoppage results primarily from neural stimuli originating in the peripheral nerve receptors rather than from direct effects of oxygen deficit on the heart.

National Heart Institute scientists Paul A. Ebert, Lazar J. Greenfield, and W. Gerald Austen reported their studies to the American College of Surgeons in Atlantic City (October 15 - 19, 1962).

The investigators used two heart-lung machines so that the coronary circulation and the systemic circulation could be perfused independently. When the heart was perfused with blood low in oxygen but the systemic circulation was perfused with normal, fully oxygenated blood, no significant change in heart rate or rhythm was noted.

However, when hypoxia was produced in the systemic circulation, heartbeat slowed abnormally in all animals and ceased altogether in two of them, even though their hearts were being perfused with fully oxygenated blood.

Sudden systemic hypoxia produced more severe reactions than gradual hypoxia; the most severe reactions occurred when both the systemic circulation and cardiac circulation were perfused with blood low in oxygen.

When the vagal nerves leading to the heart were severed, the effects of systemic hypoxia were abolished.

The investigators concluded that decreased levels of oxygen in the systemic circulation somehow stimulate neural receptors which can slow and even stop the heart. This can happen even when the heart itself is receiving adequate oxygen from its own blood supply.

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## Naval Medical Research Reports

U. S. Naval Medical Neuropsychiatric Research Unit, San Diego 52, Calif.

1. Leadership in Small Isolated Groups: MR 005. 12-2004 Subtask 1 Number 62-13.
2. The Relevance of Behavioral Statements in the Judgments made by Clinicians, Corpsmen, and Line Superiors: MR 005. 12-2201 Report No. 62-9.
3. Analysis of Adjustment Dimensions in Small Confined Groups: MR 005. 12-2004 Subtask 1 Report 62-3, March 1962.
4. Human Adaptation to Antarctic Station Life: MR 005. 12-2004 Subtask 1 Report 62-12, June 1962.

U. S. Naval Medical Research Unit No. 2, Taiwan.

1. Detection of Microfilariae in Peripheral Blood of Monkeys by the Microcapillary Technique MR 005.09-1601. 3. 8, April 1961.
2. Bacteriological Studies on Trachomatous and Normal Persons from Three Areas on Taiwan: MR 005. 09-1201. 12. 18, July 1961.
3. Venoms of Taiwanese Snakes - Lecture and Review Series No. 61-3, August 1961.
4. Encephalitis on Taiwan Parts I to VI: MR 005. 09-1201. 2. 1, December '61.
5. Adenovirus Neutralizing Antibodies in Persons on Taiwan: MR 005. 09-1201. 10. 5, December 1961.
6. Effect of Trachoma Virus Vaccine on the Course of Experimental Trachoma Infection in Blind Human Volunteers: MR 005. 09-1201. 12. 17, December '61.
7. Antigenic Relationships of Trachoma Virus Strains in the Mouse Toxicity Prevention Test: MR 005. 09-1201. 12. 7, March 1962.
8. Further Studies with a Complement Fixation Test for Trachoma: MR 005. 09-1201. 12. 8, March 1962.
9. Trachoma in the Taiwan Monkey, Macaca Cyclopis: MR 005. 09-1201. 12. 9, March 1962.
10. Trachoma Vaccine Studies on Taiwan: MR 005. 09-1201. 12. 10, March '62.
11. A Study of the Seasonal Succession of Some Medically Important Insects in the Taipei Area: MR 005. 09-1406. 2. 1, June 1962.
12. Tissue Copper Levels in Chinese Patients with Wilson's Disease: MR 005. 09-1901. 2. 2, June 1962.
13. The Epidemiology of Japanese Encephalitis Virus on Taiwan in 1961: MR 005. 09-1201. 2. 9, June 1962.

# DENTAL SECTION

## Disinfection of Clinical Thermometers

Eleanore S. Wright and R. A. Mundy, Research and Development Laboratories, Lehn and Fink Products Corporation, Bloomfield, N. J. Studies on disinfection of clinical thermometers. II. Oral thermometers from a tuberculosis sanatorium. Appl Microbiol 9:508-510, November 1961. Dental Abstracts 7(10):620, October 1962.

In this test of various disinfectant solutions, Becton-Dickinson oral thermometers were sterilized, then taken to a tuberculosis sanitarium and placed in the mouths of patients with active pulmonary tuberculosis. The thermometers were collected in a second sterile tray and returned within 3 hours to the laboratory. Each thermometer was placed in a sterile, capped tube containing sufficient disinfectant for complete immersion. After 15 minutes at 20° C., each thermometer was rinsed in a tube of distilled water containing suitable neutralizer, then transferred to a tube of culture medium. Tubes were incubated at 37° C. for 8 weeks.

One hundred thermometers were tested with each of the following disinfectants: ethyl alcohol, 50%; synthetic phenolic no. 1 (phenol coefficient 10), o-hydroxydiphenyl and p-tertiary-amyl phenol solubilized by potassium ricinoleate; synthetic phenolic no. 2 (phenol coefficient 10), potassium o-benzyl-p-chlorophenate and o-benzyl-p-chlorophenol solubilized by potassium ricinoleate; synthetic phenolic no. 3 (phenol coefficient 5), o-hydroxydiphenyl solubilized by potassium ricinoleate; commercial iodophor, iodine solubilized by nonionic detergent (1.6% available iodine); and benzalkonium chloride. As controls, 166 thermometers were placed in 0.5% sodium hydroxide, and 95 thermometers were placed in 0.5% sodium hydroxide and centrifuged for 30 minutes.

The control thermometers demonstrated that about 10% of thermometers from mouths of patients with active pulmonary tuberculosis exhibited acid-fast bacilli.

The results, in conjunction with data from Part I of these studies (Wright and Mundy, 1958), led to the following conclusions.

Of the disinfectants tested, 70% ethyl alcohol, 2% synthetic phenolic no. 1, and 3% synthetic phenolic no. 3 are reliable disinfectants for thermometers. Fifty per cent ethyl alcohol, 2% synthetic phenolic no. 2, 2% iodophor, and 0.1% benzalkonium chloride, aqueous or tincture, are unreliable disinfectants for thermometers.

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## Root Canal Cultures Not Time Consuming

Julius Fox and B. Kalman Friedman. Long Island Jewish Hospital, New Hyde Park, N. Y. Endodontic economics: an additional reason for bacteriologic control. New York State Dent J 28:157-159, April 1962. Dental Abstracts 7(10):592-593, October 1962.

The taking of root canal cultures does not unduly prolong endodontic treatment and it may contribute to a good result.

One hundred general practitioners not using bacteriologic controls reported an average of 3.83 visits to complete root canal treatment, in a survey conducted by the authors.

A review of the literature (Crowley and Ostrander, 1948; Auerbach, 1953; Bender, 1954, and Stewart, 1955) indicates that 40% of all root canals are "sterile" before treatment commences, regardless of their clinical or roentgenographic appearance. The remaining 60% may be infected, and of these 75% can be rendered "sterile" in one visit, if proper chemicomechanical technics are employed. This makes it statistically possible to complete at least 85% of endodontic treatments in two visits.

In the past, the use of cultures in the general practitioner's office was considered expensive and time consuming. Today, however, small dental incubators can be purchased for less than thirty dollars. Sterile, prepared culture tubes are available at a modest price from most dental supply houses. These are the only special supplies needed. Chairside procedure involved in taking a bacteriologic culture requires less than two minutes. Its proper execution expedites completion of almost all root canal treatments.

Bacteriologic controls provide a check against faulty technic. A negative culture indicates that the number of viable bacteria has been sufficiently reduced so they cannot be grown in a culture test tube. This implies that any remaining microorganisms will not find the environment now established in the root canal suitable for propagation.

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## Base Materials for Amalgam Restorations

M. L. Carlton, Jr., Baylor College of Dentistry, Dallas, Texas. Texas Dent J 79:4-6, Nov. 1961. Dental Abstracts 7(10):623, October 1962.

In this study of base materials and types of condensation, Class I preparations were cut in extracted molars, with an air rotor. The preparations were about 3 mm. deep. Bases (either zinc phosphate cement, Dycal, Cavitec, or zinc oxide-eugenol with one drop of zinc acetate) were placed in the preparations. Within two minutes, amalgam condensation was begun. New True Dentalloy was proportioned on a scale at a ratio of 5:7, and mixed 20 seconds in a mechanical amalgamator. Three types of condensation were used—hand pluggers,

Amal Pac, and Wright's condenser.

Twenty-four hours after the restorations were packed, the teeth were sectioned, photographs were made of these sections at a magnification of X5, and the photographs and sections were studied.

Zinc phosphate cement is an excellent base material for amalgam restorations. Zinc phosphate cement and Dycal show adequate strength to withstand the force of good condensation. Cavitec proved adequate, except with the use of hand pluggers.

The use of zinc oxide-eugenol as a base material for amalgam restorations with accepted methods of condensation is contraindicated. A zinc oxide-eugenol base is easily displaced by condensing pressure and may even flow to the margins of the filling. It also allows the amalgam to be depressed in close proximity to the pulpal floor, thus defeating the purpose of a base.

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## Ionization Treatment of Sensitive Teeth

Joe J. Simmons, Jr., 728 Medical Arts Building, Dallas, Texas. Ionic desensitization of teeth, Texas Dent J 79(12):11-17, December 1961. Dental Abstracts 7(10):594-595, October 1962.

In a one year period 727 teeth of 304 patients were treated with a technic of controlled fluoride ionization. The treatment eliminated existing hypersensitivity in 99.4% of hypersensitive teeth, and reduced the expected postoperative hypersensitivity. The desensitizing effects apparently were permanent. None of the teeth or surrounding tissues showed any clinically detectable pathological changes from the ionization treatment.

The effect and safety of ionization depend on precise control of the strength of the ionizing solution, amount of current, and duration and site of application.

A 1% solution of sodium fluoride is used. Distilled water and not tap water should be used, and the solution should be stored in a plastic rather than a glass container. The teeth to be treated should be free of all debris. They should be rinsed with water, isolated with cotton rolls and dried with cotton or warm air. The sodium fluoride solution is prewarmed to body temperature and applied to the areas of treatment with a cotton pledget.

A miniaturized, hand-held ionizing device with a potential of 9 volts is used. Dosage should not exceed 1 ma. per minute. The patient is instructed to hold the ionizing instrument with light, fingertip pressure near his face so that the dentist can read the meter.

If the patient's teeth are too hypersensitive for application of the fluoride solution with a cotton pledget, the solution should be diluted to 0.01%. Solution strength can be increased gradually as treatment progresses, to 0.1%, 0.5%, and 1.0%. The solution is applied with a brush in a slow painting motion, or the brush with wet bristles is held over the area to be treated.

In patients who obtained only partial relief from fluoride ionization, the topical application of calcium hydroxide or calcium chloride brought further relief almost immediately.

Monitoring of the milliammeter showed an increase in electrical resistance (decreased milliampere reading) in most teeth treated with fluorine ionization.

The biogalvanic or chemical mechanisms by which the clinical effects of ionization treatment are obtained are not known.

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## Personnel and Professional Notes

Dental Officers Recently Retired.

Capt James C. Reader, DC, USN - TDRL 1 September 1962, St. Albans, N.Y.

Capt Harry E. Denen, DC, USN - Retirement 1 November 1962, Pensacola, Fla.

LCdr Samuel T. Williams, DC, USN - TDRL 1 October 1962, Portsmouth, Va.

BuShips Instruction 9640.27 of 10 October 1962.

Subj: Increased illumination requirements for dental operating spaces

The purpose of this instruction is to authorize increased illumination in dental operating spaces to alleviate eyestrain and fatigue.

Reports have been received in BuShips from the fleet of known or suspected cases of dental officers suffering eyestrain or fatigue due to insufficient lighting and too much contrast between the visual task and surrounding areas. The Ship's Transportation Section of the "Illuminating Engineering Society Handbook," Third Edition, recommends that 30 foot-candles, maintained illumination, should be provided in ships' dental rooms. The Chief, Bureau of Medicine and Surgery stated that immediate steps should be taken to comply with the recommendation of the I. E. S. Handbook.

Specific provisions for improving lighting in dental operating spaces are provided.

First Postgraduate Course in Forensic Dentistry. A new and unusual venture in postgraduate dental education was inaugurated October 8-12, 1962, at the Armed Forces Institute of Pathology, Washington, D. C. This was the first postgraduate course on this subject to be presented anywhere.

The 5 day course was directed by Captain Louis S. Hansen, DC, USN, Chief, Dental and Oral Pathology Division, AFIP. The faculty included many outstanding specialists in this field from the Dental, Medical and Legal professions and the Federal Bureau of Investigation.

A unique aspect of the meeting was a simulated aircraft crash in which the participants in the course were called upon to identify, by means of dental records, preserved human remains.

Also of interest, was the presentation of a court room drama in which a dentist was sued for the alleged removal of the wrong tooth.

Fifty-one dentists and lawyers were registered in the course with representatives from the Armed Forces, the Public Health Service, and the Veterans Administration, as well as civilian practitioners.

The course was simultaneously broadcast over the closed circuit Washington Military Medical television network.

Doctor David B. Scott from the National Institute of Dental Research presented material concerning dental evidence in identification and his method of determining age by means of the teeth. Squadron Leader Peter J. Stevens of the Royal Air Force and Dr. John J. Salley from the Medical College of Virginia gave first hand accounts of their experiences in mass disasters. Among the dentists on the faculty were Doctor Albert A. Dahlberg of the University of Chicago and Doctor Viken Sassouni of the University of West Virginia.

The discussions on dento-legal matters were led by Major William R. Rule, USAF, MSC, Chief Legal Counsel at the Institute. He was assisted by other lawyers including Mr. Harvey Sarner, Assistant Secretary of the American Dental Association, Chicago, Illinois, Dr. Joseph Jachimczyk, Chief Medical Examiner, Houston, Texas, and Professor Henry P. Weihofen, Professor of Law, University of New Mexico.

Newly Standardized Dental Items.

| FSN | Nomenclature | Unit Issue | Unit Price |
|---|---|---|---|
| 6520-817-2558 | Floss, Waxed, Dental, Flat Tape, 100 yds | SP | .64 |
| 6525-817-2559 | Film, Radiographic Dental, High Speed, 1-1/16" x 2-1/8", 25's | PG | 1.85 |

Dentists in Latin America. The utilization of dentists is closely related to the socioeconomic conditions of a country. In Latin America the ratio of dentists to the population is very low, 1.9 dentists per 10,000 population. By country the range is from 0.4 to 6.1 per 10,000 population. Only 2 countries have 5.0 or more, but 8 have less than 1.0 per 10,000 population. Altogether there are 38,000 dentists in Latin America with 87% located in South America. Dentists tend to be concentrated in large cities and thus the ratios outside the large cities are much lower than the above figures.

Special problems are: 1. Very low enrollments in many schools. 2. Importance of placing emphasis on teaching preventive measures and public health to undergraduates. 3. Lack of specialized courses in public health for dentists. 4. Lack of facilities and programs for training dental assistants. (Facts on Health Problems, PAHO, WHO, July 1961)

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## AVIATION MEDICINE DIVISION

### Aeromedical Appraisal of F4H-1/Sparrow III Weapon System

G. G. Lucchina and C. G. Phipps, Bio-Medical Division, Life Sciences Department, U. S. Naval Missile Center, Point Mugu, Calif. (Technical Memorandum No. NMC-TM-62-16, 29 June 1962.)

Introduction

The objective of the part played by the Bio-Medical Division of the Life Sciences Department in the evaluation of the F4H-1F/Sparrow III weapons system under BUWEPS WEPTASK RM-37210, task N01, was the aeromedical appraisal of the subject system with particular emphasis on stresses which might be incurred in the operational environment and on problems which might arise in the life-support system. The philosophy behind such an investigation is the consideration of men as integral components of the above and any weapon system, and that man, by his very nature, is limited and certainly not infallible. Therefore, any data which might be compiled which would foretell and allow correction of the human factor link in a weapon system should be obtained.

The general plan of this investigation was to follow two simultaneous paths. One phase evaluated the life-support gear in the F4H with particular emphasis on the Mark IV full pressure suit through personal contact with pilots, radar operators and other personnel involved in the evaluation, and also through a questionnaire inviting comments from participants which was filled out before and after each flight in which the full pressure suit was worn. The other path of investigation involved in-flight observation of various physiological functions of pilots and radar operators during operational missions involving the subject weapons system. This was accomplished by magnetic tape recording of physiological parameters during various phases of flight profiles.

An abstract of procedures followed and comments on results obtained by the above methods are described below.

Mark IV Full Pressure Suit Evaluation

The bulk of data obtained concerning problems in use of the Mark IV full pressure suit was through the evaluation of the results of a standard questionnaire.

As noted above, this questionnaire was filled out prior to and after each flight by all participants wearing the full pressure suit. At this time they were also interviewed concerning problems which might not be listed in the questionnaire. In general, it was found that, although the interviews were important in clarifying issues, most problems were covered in the questionnaire.

It seems that problems with the Mark IV full pressure suit fall into 3 general categories. The first of these involves routine maintenance, which does not fall within the scope of this report.

The second area of difficulty is that of mobility of the Mark IV full pressure suit. When their suits were deflated, most of the participants in this program considered that their mobility was not significantly impeded and that at least subjectively the ventilation of the suit was adequate. However, a great majority felt that if the suit were pressurized they would not be able to accomplish their mission and in most cases might lose the aircraft and crew. The fact that one pilot was involved in several pressurizations and felt that on one occasion he could have controlled the aircraft and completed his mission while on 2 other occasions that he could not have accomplished complicated maneuvers, points up the fact that the question of function in a full pressure suit which is pressurized is a matter of proper fit and adjustment, the pressure differential in and out of the Mark IV full pressure suit, and the task to be accomplished. General consensus was that an intercept could be accomplished but all switches could not be reached and complex maneuvers were precluded.

Finally, specific problems were encountered in visibility and in proper use of g-suit while flying in the Mark IV full pressure suit. Most of those tested felt that the visibility in the Mark IV full pressure suit helmet was superior to what was experienced while wearing the APH-5/A13A helmet/oxygen mask combination except for difficulty with various reflected images on the faceplate and more often, fogging of the faceplate. The various defogging compounds seemed to work well in most cases, however with some individuals, fogging was a particularly annoying problem. The possibility is suggested of modifying existing suits so that an increase in the flow of oxygen over the faceplate might alleviate the fogging problem. Regarding the g-suit connection, the problem seems to be that the portion of the g-suit hose from the g-suit itself to the opening in the Mark IV full pressure suit is not secured to the full pressure suit until the connection to the aircraft is made. This requires considerable effort and several contortions on the part of the pressure suit wearer to achieve proper mating of the two g-suit components. It is suggested that the connection between the inner g-suit hose and the full pressure suit be modified to enable the wearer to secure these two components together while donning the Mark IV full pressure suit.

## In-Flight Monitoring System

The second phase of the aeromedical appraisal of the F4H-1F/Sparrow III weapons system involved in-flight monitoring of various physiological parameters utilizing portable magnetic tape recording. All possible flights in F4H,

F3H, F9F, F8U, and TV aircraft were monitored. Pertinent to this report are the 16 monitored flights in F4H aircraft. Data were obtained during these flights by monitoring either the pilot or the radar operator in various stages of performance of missions involving both launch and captive flight of the Sparrow III missile. It was decided at the onset of this program that the electrocardiogram (ECG) furnished the most reliable index of stress of which current state-of-the-art techniques allowed dependable and meaningful monitoring at this time. Therefore the system utilized was built around the concept of monitoring in-flight electrocardiograms with a view toward monitoring additional physiological parameters as proper techniques are developed within our division.

## Results and Comments

Gross conduction defects did not occur at any time during this study. Only gross and obvious defects of this nature can be discussed at this time. Rates rose from normals of 65 to 80 during pre-flight to a maximum of 180 beats per minute during more stressful phases of operations. All of the recorded complexes originated in the sino-atrial node and were all conducted through the atrio-ventricular node on the usual path. No arrythmias were noted, other than sinus tachycardia.

Rate proved an excellent index of the stressful nature of the mission and correlated directly with the task at hand. For instance, an average of 75 beats per minute was recorded during pre-flight checks, 90 to 100 beats per minute during pre-launch phases, 130 to 180 during launch phases, and rates of 90 to 110 beats per minute while returning to base.

It was noted that there were individual differences among participants in this program as might be expected. That is to say, the heart rates of some were accelerated more than others. No significant difference could be noted in the data obtained from pilots as opposed to those obtained from radar operators, and both showed equivalent increase in heart rates depending on the mission at hand. No adverse effects of these very rapid rates were noted. These data fit in with available Air Force data compiled in the X-15 and X-100 aircraft.

## Conclusions and Recommendations

It is obvious from this investigation that more work needs to be done on refinement of a full pressure suit which allows more activity while in the pressurized state and, in the suit currently in use, it is recommended that an effort be made to improve visibility which is impeded by both reflections and fogging. It is suggested that in individual cases, oxygen flow over the faceplate may be increased, thereby enhancing evaporation of any moisture which may collect on the faceplate. It is also suggested that a device be designed to couple the g-suit hose to the full pressure suit during the donning of the suit so that function of the g-suit will not be lost by accidental decoupling during operations.

Data obtained by in-flight recording during launch operations have indicated that sinus tachycardia is encountered which (and this is speculation) would probably incapacitate the participant if it were maintained over several days. However, during the brief periods in which it is present, this condition is not detrimental to the function of the pilot or radar operator as far as can be determined with the parameters monitored. Monitoring of more physiologic parameters is indicated to investigate this possibility. It is suggested that an upgrading of the bio-medical monitoring system is indicated and efforts are being made in this direction. As mentioned above, this division is endeavoring to upgrade the in-flight recording system and also work is going on to enable monitoring of flows and temperatures in and out of various portions of the full pressure suit, concentrations of various gases in and out of the full pressure suit, respiratory rate and depth, blood pressure, and electroencephalograms. Efforts are also being made to further refine our data-acquisition system so that more data may be obtained from the electrocardiogram.

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## Anthropometric Measurements of Naval Aviators

At the request of the Bureau of Medicine and Surgery, the Bureau of Naval Weapons and the U. S. Naval Air Material Center (Air Crew Equipment Laboratory (ACEL)), Philadelphia, Pennsylvania, studied, constructed, and validated a device with reporting forms for required anthropometric measurements of naval aviators. These units, along with instructions and reporting forms, have been furnished five (5) commands for a field trial.

It has been requested that the U. S. Naval School of Aviation Medicine (NAVSCOLAVNMED), Pensacola, Florida, make initial measurements on all flight training students and student aircrewmen on this device and report the findings as printed on the reporting form (one copy to health record, one copy to the Bureau of Medicine and Surgery (BUMED), attached to Form 88, and one copy to ACEL). The other four (4) commands, namely, U. S. Naval Air Station, Oceana, Virginia Beach, Virginia; U. S. Naval Air Station, Miramar, California; U. S. Marine Corps Air Station, Cherry Point, North Carolina; and U. S. Marine Corps Air Station, El Toro, Santa Ana, California, have been requested to measure all aviators and aircrewmen on the occasion of their annual physical for the 25th, 30th and 35th anniversaries of their birth. Should no Form 88 bureau submission be required, the anthropometric reporting form (Fig. 1) will be forwarded to BUMED (Code 511).

Representatives of ACEL will visit the five (5) commands periodically to observe the use of this device and any problems encountered therewith. No local alterations are authorized without ACEL approval in order to ensure standardization and uniformity of results. Direct communication with representatives of that Laboratory for this purpose is authorized and desired, with a copy of all written communications to BUMED (Code 52).

ANTHROPOMETRIC DATA FORM
4ND-NAMC-6150/1 PRINT OR TYPE PLAINLY

| NAME (last, first, and middle initial) | | | | SERIAL NUMBER |
|---|---|---|---|---|
| RANK | AGE | TYPE AIRCRAFT PRESENTLY FLYING | DATE OF EXAM. | ACTIVITY CONDUCTING EXAMINATION |

(1) _____ Pounds - WEIGHT
(2) _____ Inches - STATURE
(3) _____ Inches - SITTING HEIGHT
(4) _____ Inches - SHOULDER WIDTH
(5) _____ Inches - SITTING SHOULDER HEIGHT
(6) _____ Inches - BUTTOCK-KNEE LENGTH
(7) _____ Inches - BUTTOCK-LEG LENGTH

MEASUREMENT INSTRUCTIONS

WEIGHT - Taken to nearest pound on standard scales with subject in underwear.
STATURE - Vertical distance from floor to top of head with subject standing erect.
SITTING HEIGHT - Vertical distance from seat surface to top of head with subject sitting erect.
SHOULDER WIDTH - Distance across shoulders between greatest protrusion of deltoid muscles.
SITTING SHOULDER HEIGHT - Vertical distance from seat surface to right shoulder with subject sitting erect.
BUTTOCK-KNEE LENGTH - Distance from back of right buttock to front of kneecap with subject sitting erect.
BUTTOCK-LEG LENGTH - Distance from back of right buttock to heel of foot with subject sitting erect.

SIGNATURE (Medical Officer/Flight Surgeon)

DISTRIBUTION:
WHITE COPY - INDIVIDUAL HEALTH RECORD
YELLOW COPY - ATTACH TO MEDICAL FORM 88
PINK COPY - FORWARD TO: ACEL - NAMC
PHILADELPHIA 12, PA.

Figure 1

Later, universal use of such an anthropometric device is planned for U. S. Navy aviation examining facilities, except that original measurements will be made by the NAVSCOLAVNMED.

—(Aviation Medicine Division, BuMed)

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## Anthropometric Problems in Aircraft Man-Machine Design

Ens W. L. Smith, MSC, USNR, Assistant Aviation Physiologist, Aviation Physiology Training Unit, Medical Department, U. S. Naval Air Station, Norfolk 11, Virginia. 4 June 1962

What is the "ideal man"? Concept-wise, what is the 5 to 95 percentile man? How can you possibly design an aircraft's controls, switches, emergency handles, etc., to satisfy the anthropometric requirements of the 5 to 95 percentile ranks of flying personnel? These are some of the questions that immediately run through the minds of members of Human Engineering Teams when attempting to set up the basic requirements for a cockpit design in any given aircraft.

The 5 to 95 percentile man concept covers a very wide spectrum of anatomical shapes and sizes. We can gain insight into the problems of designing for a wide range of anthropomorphism by looking at just a few selected variables from one anthropometric study. For example, man's functional

arm reach is of importance since this is the reach necessary to actuate many controls in the cockpit area. Very important is the fact that this is the reach he may have to use in operation of emergency handles for egress from his disabled aircraft. To measure functional arm reach the subject stands erect in a corner of a room, his shoulders pressed against the rear wall, his right arm and hand extended horizontally along the side wall, except that the tips of his thumb and forefingers are pressed together. Then using a scale on the side wall you measure the distance from the rear wall to the tip of the thumb. In a study of U. S. Navy pilots performed by the Human Engineering Branch of Air Crew Equipment Laboratory, U. S. Naval Air Material Center, Philadelphia, Pennsylvania, it was found that the functional arm reach for the 5 percentile man was 25.1 inches and for the 95 percentile man 35.0 inches. The 5 to 95 percentile range is 9.9 inches or, if you like to equate this figure in terms of feet, approximately .83 feet. To extend this just a few percentile ranks further, the 1 percentile man has a 24.1 inch functional arm reach versus the 99 percentile man who has a 36.4 inch reach. This extension produces a range of 12.3 inches; furthermore, if you were to examine the distribution chart of this anthropometric variable, you would find it is bimodal in its distribution which only helps to compound design problems.

Examination of one other variable closely associated with the functional arm reach in total movement will demonstrate that no one anthropometric factor can be isolated from another. When leaning forward to actuate a lever the variable of shoulder height (sitting) can aid or hinder you in completion of a task. Essentially you get into the problem of combinations of long torso, short arms and short torso, long arms. The shoulder height is measured with the subject sitting erect, looking directly forward and his feet resting on a surface so that his knees are bent at about right angles. You then measure the vertical distance from the sitting surface to the highest point on the lateral edge of the right acromion. The range for this variable is 4.6 inches, with the 5 percentile man at 22.5 inches and the 95 percentile man at 27.1 inches. Although 4.6 inches is a much smaller anthropometric variable range, it does take on significance when related to the bimodal distribution of the functional arm reach measurements.

So far, all we have studied has been a select, highly specialized statistical population of U. S. Navy pilots. As might be expected, each statistical population in various fields of work has different anthropometric variable ranges. Is there a significant anthropometric variation between U. S. Navy pilots and other groups? The answer to this question can be found in the study "Compilation of Anthropometric Measures on U. S. Navy Pilots," Part I, 28 July 1960. Some of the conclusions reached from the results of this study by ACEL are as follows:

(1) In overall height the Navy pilot is approximately 1 to 2 inches taller than other groups throughout the whole percentile range.

(2) In the upper percentiles, between 50 to 99 percentile range, the Navy pilots were found to be 1 to 4 inches greater in shoulder height (sitting).

(3) In the functional arm reach variable the Navy pilots were found to

be 1 to 4 inches shorter in the lower percentile ranks between the 1 to 50 percentile range.

(4) In the crotch height the Navy pilots exceeded the results of other studies by 1 to 2 inches at both extremes of the percentile range.

(5) In buttock circumference (sitting), Navy pilots were found to be 2 to 3 inches smaller in this variable.

From these conclusions, which relate the anthropometric results of the Navy pilot studies with those of comparable anthropometric studies, the reason for the use of specific anthropometric data in designing for a particular group or population can readily be seen.

How can the frustrated Human Engineering Team be helped? One proposal which looks very promising is the concept of a minimum functional human envelope. This thinking involves three-dimensions of man and the space requirement necessary for him to function properly in both normal and emergency operational conditions. This proposed system is used to determine the minimum space requirements for a seated operator of a flight vehicle.

Many questions must still be answered in general considerations of anthropometric studies. With the general population changing in the many variables, what would be the time interval necessary before re-measurement of the population would be necessary to keep all data current? Differences must be taken into consideration in anthropometry of populations within specific groups. For example, the anthropometric data obtained from recruits or cadets will not necessarily apply to the operational groups such as pilots due to maturing in growth potential. Anthropometry, due to its very nature, will always be a dynamic field of study. The most definite thing about anthropometry is its change.

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## Survival of the Fighter Pilot in Enemy Territory*

Capt E. M. Wurzel, Cdr J. R. Myers, and LCdr N. K. Combs, U. S. N.

In the course of air combat missions, the fighter pilot must give thought to the possibility of being forced down in enemy territory. He must therefore be prepared to survive, evade the enemy populace and escape so that he may resume his role as an active combatant. In operating today's high performance aircraft (fighter and certain attack planes) surface environments change markedly within minutes. It becomes obvious then that it is difficult to provide the pilot with personal equipment that will protect him in multitudinous environments and still be compatible with complete flight envelope of the aircraft. Survival of the pilot in enemy territory is discussed, with particular attention to the superior protection afforded by the U. S. Navy Mark IV full pressure suit under a wide variety of environments.

*Read by LCdr Combs before the Advisory Group for Aeronautical Research and Development to NATO, at Paris, France, 9 July 1962.

Of first concern to the downed pilot is survival in the specific environment he has entered. If it is water, he must detach himself from his parachute, inflate his flotation gear and board the raft from his survival pack. In close proximity to the shore it might become necessary to abandon the raft and swim in order to minimize detection. Should he come down in an extremely cold environment his efforts would have to be directed at surviving the rigors of the weather. Traversing rugged mountains, swamps, and desert areas would each present problems for survival.

Initial survival would have a purpose and most assuredly that purpose would not be to make sure that the enemy captured an excellent specimen of homo sapiens. The pilot would next concern himself with the tactics of evasion. Unquestionably, he would be on the move. One exception to moving would be a decision to "dig in" for protection against radioactive fallout. The danger of being sighted and identified as non-native would be ever present. Flight clothing would be conspicuous so he would probably have to discard his outer flight clothing. Unless he had brought along clothing approximating that of indigenous personnel, he would be confronted with quite a problem. If he donned civilian type clothing, retention of identification that would associate him with the military in case of capture would be necessary. Previous training would dictate the time and method of travel in an attempt to reach friendly territory or a rendezvous for rescue.

Just what contribution to survival, evasion and escape could the full pressure suit make? The suit is operational in the U. S. Navy and is being introduced to elements of the U. S. Air Force. It is indeed timely and appropriate to consider its role in survival.

First, the suit can be considered as an integral component of the weapons system. By this it is meant that it permits the pilot to employ the full flight envelope of the aircraft. Also, a certain "complete the mission capability" is present. In-flight protection is provided against decompressions, oxygen deficiencies and dysbarism. We begin, therefore, with pilot equipment that not only contributes to carrying out the mission but is compatible with the airplane. If the survival situation is enhanced by the suit, it could rightly be termed a rather remarkable item of flight equipment. Let us now consider the suit in the survival situation.

In the ejection, which would undoubtedly be the means of leaving the aircraft, the suit would protect the pilot at maximum aircraft altitude and at speeds in excess of MACH One. Thus a safe egress from the aircraft would be pretty well assured.

In the event the landing was in water, the water tight integrity of the suit would keep him dry and the flotation vest would easily keep him afloat. Tests have shown that even with the suit filled with water (a condition to be avoided) the occupant will float. The pilot would board his raft, being careful to retain the survival equipment in the seat pack. When he was secure in the raft he would decide his course of action in respect to rescue or making a heading toward land.

Should anti-exposure protection be called for, such as in arctic areas or during the winter season in more southern areas, the suit would compare

favorably with conventional anti-exposure suits. Tests have shown that a subject in 28 degree water can emerge unharmed after one hour. This is indeed a severe test due to the rapid loss of body heat in water. Other tests have proved that subjects in arctic areas with ambient temperature at 40 degrees below zero Fahrenheit can remain comfortable for many hours. Retention of body heat in the suit should enable the pilot to survive indefinitely, especially if he built a shelter for himself. The suit is used routinely in the U. S. Navy when air and water temperature call for anti-exposure protection.

In a hot environment it would probably be necessary for the pilot to remove the inner rubberized liner of the suit. He could, if necessary, cut holes in the suit to facilitate ventilation. Most certainly the suit could be modified for the situation.

The tough nylon outer covering of the suit would withstand the wear and tear of travel through such rugged areas as jungles and mountains. If during evasion and escape from enemy territory the pilot did decide to divest himself of the suit to avoid detection, many valuable parts of the suit could be salvaged. There are aluminum parts, nylon line from the lacings, the neckring, hoses, and plexiglass from the visors.

In summary, the fighter pilot operating today's high performance aircraft would be over a wide variety of environments and would have to be prepared to survive in any of them. The U. S. Navy Mark IV full pressure suit would provide superior protection in a wide variety of survival conditions and would be compatible with the aircraft and its flight envelope. Previous training in the basic elements of survival would prepare the pilot to live off the land and travel to friendly territory or a prearranged point for pickup. In the final analysis, successful survival, evasion and escape would be contingent upon previous training in the art, individual ingenuity, and a determination to succeed.

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## Thoughts on Interference With Gastric Activity During Prolonged Weightlessness*

LCdr Norris K. Combs, MSC, USN. Read at the Aerospace Medical Association's 33rd Annual Convention at Atlantic City, N. J., 9-12 April 1962.

Of the many physiological functions that could be adversely affected during prolonged weightlessness, it is believed that gastric action on food could be more seriously interfered with than heretofore assumed. A review of the literature (7) reveals very little discussion on the subject and mention is usually confined to its being one of several areas that could be altered.

Unfortunately, we can only speculate on such interference with normal gastric activity. Parabolic flight maneuvers with man (2, 8) rocket flights with monkeys and mice (6), and more recently brief sub-orbital and orbital flights have provided much information on such psychophysiologic functions as orientation, sensory motor coordination, respiration, and the circulatory

system. The processing of food in the stomach is measured in hours so experience with weightlessness thus far sheds little light on the subject. It is true that the Russian cosmonaut was subjected to a period of weightlessness of about 25 hours and Lt. Col. Glenn approximately 5 hours, but even these times would not connote prolonged weightlessness. One must think in terms of several days at a minimum. Also, Titov and Glenn did not consume usual diets but took on a food mixture from squeeze tubes. We must be concerned with the bulk and variety of normal diets as well as the cycle of continuous intake and elimination. It is interesting to note, however, that Titov admitted to suffering from nausea. To what the nausea was attributed we do not know, due to scant and conflicting reports, but a gastric disturbance cannot be eliminated.

It was also reported that Titov's nausea began after 6 hours of flight. Such a delay would be expected in a gastric disturbance. It is rather interesting that Titov's reported disorientation from head movements was not corroborated by Glenn. Here of course, the factor of time or differences in otolith sensitivity are to be considered.

A serious look at the problem of gastric activity leads immediately to a review of the processing of food in the stomach. This becomes quite intriguing as there is disagreement concerning related physiology tests. Most controversial are the contractions of the stomach. We find that there are not only rhythmic peristaltic contractions but also hunger contractions. Nerve fibers to the stomach originate from the vagi and splanchnics, but stimulation of these extrinsic fibers merely regulates movements (inhibition by the sympathetic and acceleration by the parasympathetic). Also, the stomach possesses an automaticity whereby stimuli to movements probably arise from within its intrinsic nerve plexus. It would not seem wise to assume that the various stomach movements would somehow accommodate food under prolonged weightlessness. We must remember that the stomach is primarily a reservoir for food during its early physiologic functions in the process of digestion.

Two well known physiologists, while certainly not ignoring the gastric contractions, state that once food has been swallowed, its weight is sufficient to overcome the resistance of the contracted gastric wall and some of it rapidly passes to the pylorus (4, 5). Another states that gravity does not play a role (3). The investigators agree that defined contractions begin in the middle of the stomach body and progress toward the pylorus. Ripples have been observed coming down from the cardia and some think they originate, or give rise to the contractions, in the lower half. One thing is certain, and that is, there are definable contractions in the lower half of the stomach. The churning and gastric phase of digestion takes place in the pylorus and it is generally agreed that peristalsis per se is not found above the middle of the body or in the fundus. The problem could be getting the food to the pylorus. In the state of zero gravity, will food be forced downward in the stomach to where contractions will force it to the pylorus? It seems quite inconceivable that it will be if it has absolutely no weight. In fact, it is difficult to visualize how food will move from the cardia to the middle of the stomach. Some investigators believe

that the upper stomach, from the fundus, exerts a more or less constant pressure on the food, forcing it toward the middle. This is not entirely agreed upon but if such be the case, what stimulates muscle tonus to act upon the food? Any pressure or irritation of nerve endings within the stomach could be based on food weight.

How about water or other liquids passing to the pylorus. Here again it is generally agreed that the passage of a liquid to the pylorus borders the immediate. It would appear reasonable to state that a liquid passes quickly to the pylorus by virtue of its weight alone. It would seem just as logical to say that in the absence of weight, a liquid would remain in the area of the cardia.

Another interesting aspect of gastric processing of food is the observed orderly action of gastric juices. As food is received, it is held in the middle of food previously ingested. This allows the older food to be subjected to gastric juices ahead of newly swallowed food. It is thought that newly received food, by pressure, continues to push older food toward the stomach wall. Again, it would seem that pressure has as its basis gravity.

Gastric processing of food should be viewed seriously, since the condition of prolonged weightlessness cannot be simulated. Many gastric disturbances are attributed to mechanical difficulties. Extreme gastric discomfort would be serious even if the stomach could eventually handle the situation. As orbital flights progress, adequate information should be accumulated that will permit predictions of gastric response over longer time periods. Should there arise any doubt relative to gastric interference, providing orbiting personnel with a parasympathomimetic or anticholinergic agent (in order to regulate peristalsis) might be indicated. Of course, such an agent would have to be carefully selected to prevent undesirable inhibition or excitation of other areas controlled by the autonomic nervous system.

Summary

The fate of food in the stomach during prolonged weightlessness is unknown and can only be speculated upon. Nothing beyond its being mentioned was found in the literature. It is felt that the weight of food plays a definite role in its ultimate passage to the pylorus where it is processed prior to gastric evacuation. If the food is without weight, it appears highly probable that muscle tonus of the upper stomach, stomach distention, and the usual method of exposure to gastric juices will be seriously impaired. Such impairment could pose a serious threat to man's performance and well-being in space flight. During early flights into space it might be necessary to provide personnel with a parasympathomimetic or anticholinergic agent in order to regulate peristalsis.

*The opinions or assertions contained herein are the private ones of the author and are not to be construed as official or reflecting the views of the Navy Department or the Naval Service at large.

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# RESERVE SECTION

## Retirement Regulations Outlined for Reservists
(continued)

How to Check Your Retirement Credits—If you are a Reserve officer, you may obtain a statement of your satisfactory federal service (no more than once a year) by addressing a request directly to: Officer in Charge, U. S. Naval Reserve Officers Recording Activity, 30th and Fort Streets, Omaha 11, Nebr.

If you are an enlisted Reservist, you may obtain information regarding your satisfactory federal service from the commanding officer of the unit to which you are attached, from the commandant of the naval district holding your service records, or from the Chief of Naval Personnel (Pers E3).

How to Compute Retired Pay—The rate of retired pay is the number of accrued retirement points divided by 360 and multiplied by two and one-half percent times the applicable base pay of the rank or rate in which retired. Maximum is 75% of basic pay.

Points for retirement pay are credited to Reservists as follows:

Through 30 Jun 1949, 50 points are given for each 365 days of inactive duty; after 30 Jun 1949, points earned as indicated in the preceding paragraphs are credited to a maximum of 60 points each year; and one point

is credited for each day of active duty and active duty for training, including travel time.

The official method by which retired pay is computed is as follows:

(1) Add the number of retirement points earned. Divide this total by 360. Carry the resultant figure to three decimal places, then round it off to two decimal places. Example: 4735 (points) divided by 360 = 13.15.

(2) Multiply the result of the first step by two and one-half percent (.025). Carry the resultant figure to 5 decimal places, and then round it off to four decimal places. Example: 13.15 X .025 = .32875 or .3288.

(3) Multiply the result of step two by monthly basic pay. Carry the resultant figure to three decimal places, and then round it off to two decimal places. Example: Pay grade 0-5 (over 22 years), $775.00 X .3288 = $254.82.

(NOTE: For rounding-off purposes, when the last digit is five or greater, the preceding digit will be increased to the next higher number; if the last digit is less than five, it should be disregarded.)

Pay will be based upon the highest permanent or temporary rank or rate in which service was satisfactory, as determined by the Secretary of the Navy.

Retired pay begins on the effective date of retirement. This may be the first of the month after the date of reaching age 60, or the first day of the month after completion of the service requirements, whichever is later.

Income from Other Sources—Naval Reservists receiving retirement pay under this law are exempt from the dual employment statute (5 U.S.C. 62) and the dual compensation statute (5 U.S.C. 59a).

Social Security and Civil Service retirement benefits may be received concurrently with Naval Reserve retirement pay.

Neither pension nor disability compensation benefits from the Veterans Administration, nor compensation under the provisions of the Federal Employees' Compensation Act, as amended, may be received concurrently with retired pay. However, a member or former member may waive his retired pay in order to receive VA compensation or pension in lieu of retired pay, and may later elect to receive retired pay in lieu of VA compensation or pension.

What Happens if You Complete 20 Years Before Reaching Age 60?—You have four possible alternatives which may be followed if you should complete 20 years of satisfactory federal service before you reach age 60. They are:

Continue active membership—In this manner, you may increase the amount of your retirement pay by earning additional points and by adding years of service which increase the basic pay upon which your retirement pay is based.

Request transfer to the Inactive Status List—In this status, you may not earn additional retirement points. However, ISL times does count for periodic pay increases. (Basic pay is increased by additional years of service up to 22 for commanders and 26 for captains.)

Request transfer to the Retired Reserve—Except while serving on active duty, no additional points nor years of satisfactory service may be accrued in this status. However, you would remain a member of the Naval Reserve in an

"honorary" capacity and thus be eligible for certain other benefits, including longevity credit for basic pay purposes.

If you are transferred to the Retired Reserve, you are entitled to wear your uniform on appropriate occasions (for example, official ceremonies in which military personnel are taking part) and you may use your title (rank) in connection with commercial enterprises. In time of war or national emergency declared by Congress, or when otherwise authorized by law, members of the Retired Reserve may be ordered to active duty without their consent only when the Secretary of the Navy with approval of the Secretary of Defense, determines that not enough members of Reserve components in an active status are readily available. Members of the Retired Reserve are required to keep the commandant of their naval district informed of any change of address.

For additional information on transfer to the Retired Reserve without pay, see BuPers Instruction 1820.2A.

Resign or be discharged—In this instance, you would resume civilian status completely. You would be eligible only for retired pay (provided you have satisfied the basic requirements) in the nature of a pension when you reach age 60, and you would not be placed on the Retired List. You would not be eligible for any other benefits (except medicare, provided you had completed at least eight years ACDU, exclusive of ACDUTRA); similarly, you would not be subject to orders to active duty.

(to be continued)

The Naval Reservist
NAVPERS 15653, November 1962

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